Asian Journal of Education and Social Studies

Volume 40, Issue 4, Page 29-34, 2023; Article no.AJESS.97236
ISSN: 2581-6268

Teaching Digital Circuit Class and Cultivating Students' Innovation Ability Based on Curriculum Thinking

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/AJESS/2023/v40i4881

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/97236

Short Communication

Received: 02/01/2023
Accepted: 06/03/2023
Published: 09/03/2023

ABSTRACT

Digital circuit is an important course in the major of electronic information. In the teaching of the digital circuit course, in addition to imparting basic knowledge and skills, it should also focus on the construction of ideology and politics to promote the overall development of students. This paper discusses the following aspects based on the construction of the digital circuit course Civics in colleges and universities: first, the digital circuit course should focus on the ideological and political education of students.

Second, the teaching content of the digital circuit course should keep pace with the times, follow the pace of industry development, focus on practice and application, so that students can master the latest technology and tools, with the ability to solve practical problems and practical experience. Finally, the digital circuit course should focus on the cultivation of students' innovation ability, encourage students to actively participate in research projects and practical activities, and provide opportunities and platforms to help students give full play to their strengths and realize the unity of personal and social values.

Keywords: Digital circuit; curriculum thinking; ideological and political.

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1. INTRODUCTION

Digital circuit course is a very important basic course in electronic information majors, and is also an important threshold for students to master electronic information technology. With the rapid development of science and technology and the increasing social demand, digital circuit technology has been widely used and promoted [1,2]. Digital circuit course teaching Civics construction, not only focus on the cultivation of students' knowledge and skills, but also focus on the cultivation of students' ideological and moral quality, social responsibility and innovation spirit [3].

With the continuous development and application of information technology, digital circuit technology has been widely used in various fields [4,5]. In this digital era, digital circuit technology is an important force to promote social progress and economic development. The construction of digital circuit course Civics is not only a necessary path for students to master electronic information technology, but also an effective way to shape students' ideological and moral quality and improve their sense of social responsibility and innovative spirit [6]. Therefore, the construction of the thinking and politics of the teaching of digital circuit courses is not only about the learning effect of students and the quality of personnel training, but also about the sustainable development of the electronic information industry and the prosperity and strength of society [7,8].

Computational thinking skills are crucial for innovation in electronic technology [9]. By breaking down problems into manageable parts, identifying patterns, and designing algorithms, individuals can better understand complex systems and develop creative solutions to real-world problems [10]. This type of thinking is essential for software engineers and anyone looking to solve problems effectively. In today's digital age, computational thinking is a valuable asset for anyone seeking to innovate in electronic technology or solve everyday problems [11,12].

2. IDEOLOGICAL AND POLITICAL EDUCATION IN DIGITAL CIRCUIT COURSES

The digital circuit course is a basic course for electronic information majors, which plays an important role in the mastery of students' professional knowledge and the cultivation of innovation ability. However, the teaching of digital circuit course focuses not only on students' professional knowledge mastery, but also on students' ideological and political education [13,14,15].

Students need to acquire the basic knowledge and skills of digital circuits through theoretical studies and experimental operations in the digital circuits course. In the teaching process, students are introduced to the importance and role of digital circuits in practical applications and the impact and responsibility of digital circuits for the development of society through the introduction of cases, problems or experiments of an ideological nature.

The lack of emphasis on ideological and political education in digital circuit courses can impact an individual's ability to solve problems effectively, particularly in complex scenarios. Without a solid grounding in ethical considerations and social responsibility, individuals may fail to consider the broader implications of their work. This research seeks to address this gap by developing learning strategies that integrate computational skills with ideological and political education, promoting a more holistic approach to education and empowering individuals to make informed, socially responsible decisions in the field of electronic engineering.

In addition, this course also guides students to think about the role and impact of digital circuit technology in society by designing some experimental projects with social responsibility and public welfare, and deepens students' understanding and awareness of ideological and political education in digital circuit courses [16].

To address the ideological and political education in the digital circuit course, this study will discuss how to focus on students' ideological and political education and improve the teaching quality of the digital circuit course by combining the teaching practice of the digital circuit course.

3. PRACTICAL TEACHING OF THE COURS

With the continuous development of information technology, digital circuits, as a basic course in the field of information, needs to keep up with the times and keep pace with the development of the industry in order to meet the practical needs. In the teaching process of the digital circuit course,

we focus on practice and application so that students can master the latest technologies and tools, and have the ability to solve practical problems and practical experience. To address this issue, we focus on introducing practical teaching and application cases into the digital circuit course to improve students' practical skills and ability to solve real-world problems. By studying how to use advanced digital circuit simulation tools and experimental equipment, we strengthen practical teaching sessions to help students better understand and master digital circuit principles and design methods.

With the continuous development of digital electronics and the expansion of application fields, the teaching contents of digital circuit courses also need to be updated and improved. The question of how digital circuit lectures are packaged in a learning model that accommodates practice and application is a critical one. One common approach is project-based learning, which allows students to work on real-world projects that require the application of the concepts learned in the lectures. This approach emphasizes hands-on learning and encourages students to take an active role in their education. Another approach is the use of case studies, which provide students with a detailed analysis of a real-world problem or scenario. This approach allows students to apply the concepts learned in class to a specific context, deepening their understanding of the material and enhancing their problem-solving abilities. Ultimately, the choice of learning model will depend on a variety of factors, including the goals of the course, the needs of the students, and the available resources.

First of all, digital circuit design as a practical task requires students to have certain ability to solve practical problems and practical experience, and it is not enough to stay only at the theoretical level; students need to practice to deeply understand and master the knowledge they have learned. In the course, students will be able to experience the practical application and role of digital circuits by designing and implementing experiments on digital circuits. Students can also develop practical application and problem-solving skills through practice and case studies so that they can better cope with real-world problems in their future jobs; in addition, the digital circuits curriculum focuses on the latest technologies and tools. With the continuous development of technology, the tools for digital circuit design are constantly updated and upgraded. Therefore, the digital circuit curriculum needs to be updated to include the latest technologies and tools to keep students up-to-date with the latest digital circuit design methods and tools. Students also need to be taught how to use these tools for the design and simulation of digital circuits.

As a practical example, the popularity and application of the Internet of Things (IoT) has become very common today, and digital circuits play an important role in IoT applications. In the digital circuits course, digital circuit components and modules commonly used in the IoT field, such as microcontroller-based digital signal processors, data converters, sensors, etc., are introduced. It also introduces how to apply these components and modules in IoT scenarios, such as controlling lights, temperature, humidity, etc. in smart homes, or sensors and control modules in autonomous driving systems for vehicles. By teaching in this way, students not only learn about the latest IoT technologies and applications, but also are able to apply their knowledge of digital circuits to real-world scenarios, enhancing their practical skills and experience. In addition, this teaching method of combining digital circuit courses with cutting-edge technologies such as IoT can also cultivate students' innovative thinking and spirit of inquiry, thus laying a solid foundation for their future development.

4. INNOVATIVE CAPACITY DEVELOPMENT

The innovative ability cultivation of the course should be reflected in several aspects. First, the teaching content needs to be close to practical applications, and students are encouraged to focus on innovative thinking in the learning process. For example, during the lecture, introduce some new technologies and tools that are being used in the industry, and encourage students to explore the principles and mechanisms behind them and come up with their own ideas and improvement plans; secondly, in order to stimulate students' enthusiasm for innovation, organize some research projects and practical activities, so that students can learn and improve their innovation ability in practice. Through these practical activities, students can gain an in-depth understanding of the principles and applications of digital circuits, acquire practical skills and problem-solving abilities, and have the opportunity to come up with their own innovative ideas. In addition, to help students

better utilize their strengths, the university has set up a number of student science and technology innovation bases and research practice platforms to encourage students to actively participate in them and provide professional guidance and support. Students can form teams and participate in academic competitions at home and abroad, such as the National Student Electronic Design Competition, to showcase their research results and innovations.

The digital circuit course takes the following measures in focusing on the development of students' innovative abilities. This lecture focuses on problem exploration, specifically examining how the Internet of Things can be used to address various challenges in everyday life. Students work in groups to identify problems and develop solutions using IoT technology. Through this process, students learn to think critically and creatively, developing their problem-solving skills and gaining a deeper understanding of the potential of IoT. The group work involves brainstorming sessions, where students generate ideas and discuss potential solutions. They also engage in active listening and communication to ensure that all members of the group have the opportunity to contribute their ideas. Finally, students are encouraged to present their solutions to the class, providing feedback to their peers and refining their ideas based on input from others. By engaging in this collaborative problem-solving process, students gain valuable experience and develop the skills needed to tackle complex challenges in a variety of contexts.

Guiding students to conduct research projects and practical activities. In the course, students are encouraged to actively participate in research projects and practical activities to improve their practical skills and problem-solving abilities by setting up teaching contents and case studies to stimulate their interest and creativity. For example, a course project on digital circuit design is set up to allow students to design, build and test digital circuits on their own to improve their innovation and practical skills.

Provide opportunities and platforms to help students bring their strengths into play. The university has built a digital circuit laboratory to provide students with a better learning environment and a practical platform. Students are encouraged to participate in various competitions and activities, such as electronic design competitions, which give students the opportunity to showcase their innovative achievements and practical experience, and also enable them to be exposed to more industry information and cutting-edge technologies.

Focus on the unity of students' personal development and social values. The digital circuit course can set up some course projects or extracurricular practical activities, focusing on cultivating students' teamwork spirit and sense of social responsibility. For example, a digital circuit application project can be designed to allow students to team up independently to design and implement a digital circuit application with practical social value, such as a smart home system or an intelligent health monitoring device, based on the actual needs of society, thus allowing students to realize the unity of personal and social values in innovative practice. Or, let students team up on their own to design and create a digital clock circuit that is required to display hours and minutes and can be adjusted by pushing buttons. The circuit consists of a clock circuit, a frequency divider circuit, a counter circuit, a display control circuit and a push-button control circuit. Through this project, students can learn and apply knowledge and skills of digital circuits, such as timing circuits, logic circuits, circuit design and simulation, as well as develop their practical skills and creative thinking skills.

Through the implementation of the above measures, the digital circuit course can not only improve students' innovation and practical ability, but also cultivate students' sense of social responsibility and teamwork spirit, further promoting students' overall development and growth.

5. CONSTRUCTION EFFECTIVENESS

Assessment is a critical component of any effective learning strategy, and in this research, both assessment for learning and assessment of learning are utilized to measure the effectiveness of the learning model. Assessment for learning is an ongoing process that allows students to receive feedback and make adjustments to their learning strategies. This type of assessment is used throughout the learning process, providing students with the opportunity to reflect on their progress, identify areas where they need to improve, and develop strategies to address these areas. Assessment of learning, on the other hand, is used to measure the overall effectiveness of the learning model and to

evaluate student achievement. This type of assessment is typically conducted at the end of a course or unit and provides information about how well students have mastered the material covered. By using both assessment for learning and assessment of learning, researchers can gain a comprehensive understanding of the effectiveness of the learning model and make adjustments as needed to ensure that students are achieving the desired learning outcomes.

Through the construction of digital circuit course Civics, students not only learn the knowledge and skills related to digital circuits, but also focus on the ideological and political education, practical ability and innovation ability of students. The comprehensive training of these aspects enables students to have a more comprehensive understanding of the application and significance of digital circuits, as well as the ability to apply them in a practical and innovative way, and the ability to solve practical problems.

At the same time, the construction of Curriculum Civics also provides an important platform for the university to promote the integration and innovation of teaching resources and stimulate the creativity and enthusiasm of teachers. Through research projects and practical activities, students and teachers jointly explore the frontiers and new technologies of digital circuit applications, improving teaching and research.

The active participation and innovative spirit of students and teachers have contributed to the development and progress of the digital circuit field. At the same time, the successful experience in the construction of digital circuit curriculum thinking and politics also provides reference and inspiration for the construction of curriculum thinking and politics in other disciplines. The results of the assessment carried out provide a basis for reflection on the effectiveness of the learning model in achieving the curriculum objectives. Through this reflection, researchers can identify areas where the implementation of the curriculum was successful and areas where it fell short. Effective aspects of the implementation may include the use of project-based learning and case studies, which provided students with practical experience and encouraged critical thinking and problem-solving. However, areas that were lacking may include a need for greater emphasis on ethical and social considerations in the use of IoT technology. By reflecting on the results of the assessment and identifying areas where the implementation of the curriculum fell short, researchers can make necessary adjustments and improvements to ensure that future iterations of the course are more effective in achieving the desired learning outcomes. This reflective process is an essential aspect of curriculum thinking, as it allows educators to continuously improve and refine their teaching practices to better serve the needs of their students.

6. CONCLUSION

Through the development and continuous improvement of the digital circuit course with a focus on ideological and political education, practical application, and innovation ability, students will be equipped with not only technical skills but also social responsibility, innovation, and teamwork. Teachers will guide students' growth and encourage the cultivation of skills to solve practical problems. The digital circuit curriculum will keep pace with industry development, emphasizing the latest technologies and tools, and incorporating practical experience into student learning. Through the implementation of project-based learning and case studies, students will be able to apply their knowledge to real-world situations. The assessment will be used to measure the success of achieving the curriculum objectives, with a reflection process to identify areas of success and areas that need improvement. These practices will lead to the continuous improvement of talent training quality and contribute to the development of China's information industry. Ultimately, this approach will empower students to be successful problem solvers in their everyday lives using digital circuit skills with a foundation in ideological and political education.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/97236